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ANNUAL REPORT OF PROGRESS, 1964 - 1965

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-6

SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME
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INTRODUCTION

This report of progress consists of Job Segment Reports from the State of Alaska Federal Aid in Fish Restoration Project F-5-R-6, "Sport Fish Investigations of Alaska."

The project during this report period is composed of 23 separate studies designed to evaluate the various aspects of the State's recreational fishery resources. Of these, eight jobs are designed to pursue the cataloging and inventory of the numerous State waters in an attempt to index the potential recreational fisheries. Four jobs are designed for collection of specific sport fisheries creel census while the remainder of the jobs are more specific in nature. These include independent studies on king salmon, silver salmon, grayling, Dolly Varden, a statewide access evaluation program and an egg take program.

A report concerning the residual effects of toxaphene accumulates the findings of a three-year study. The report presented here terminates this segment and is a final report. The information gathered from the combined studies will provide the necessary background data for a better understanding of local management problems and will assist in the development of future investigational studies.

The subject matter contained within these reports is often fragmentary in nature. The findings may not be conclusive and the interpretations contained therein are subject to re-evaluation as the work progresses.

JOB COMPLETION REPORT

RESEARCH PROJECT SEGMENT

STATE: ALASKA Name: Sport Fish Investigations of Alaska.

Project No.: F-5-R-6 Title: Inventory and Cataloging of the Sport Fish and Sport Fish Waters in the Bristol Bay and Lower Kuskokwim Drainages.

Job No.: 12-A

Period Covered: March 16, 1964 to March 1, 1965.

ABSTRACT

A reduction in the return of king salmon (Oncorhynchus tshawytscha) to the Naknek watershed occurred during 1964. This reduction may be the result of the effects of the combined sport, commercial and subsistence fisheries in the parent cycle. Escapement data are available for only 1963 and 1964.

Fishing success for rainbow trout (Salmo gairdneri) in the Naknek River continued to decline. Catches during late May and early June were found to include fish which were still spawning. Large rainbow trout from the Naknek River show a more rapid growth rate than do rainbow trout from tributary streams of the same system.

Rainbow trout and grayling (Thymallus arcticus) from King Salmon Creek were found to grow larger and more rapidly than those in Big Creek. Both streams are tributaries of the Naknek River. Grayling in the catch sample were more than twice as numerous as rainbow trout.

Rainbow trout were numerous in Kulik River and Alagnak (Branch) River system, but the majority of the catch was small. The presence of two races of differing growth rate is suggested.

Lake trout (Salvelinus namaycush) from Tikchik Lake require up to 13 years to reach a length of 32 inches and a weight of 10 pounds.

Data on catch composition and mean size of sport fish species from King Salmon River and Old Stuyahok River, Nushagak watershed, are presented for the years 1962 to 1964. Fishing success is excellent.

The 1964 return of king salmon to the Nushagak River watershed was unusually high. The commercial catch was the highest in the past 35 years and escapement indices ranged from satisfactory to excellent.

Grayling 20 inches long from the Ugashik Lakes evidenced ages of 8 and 9 years, but additional sampling is necessary for a satisfactory age-growth study.

Investigation of sport fish in the Kvichak River watershed during the study period is covered in a separate report.

RECOMMENDATIONS

1. The commercial king salmon fishery of the Naknek - Kvichak District should be studied in cooperation with the Commercial Fisheries Division to determine its relative effect upon the Naknek and Alagnak River stocks.
2. The king salmon spawning areas of the Alagnak River should be located and index areas defined for survey purposes.
3. A weir should be constructed on King Salmon Creek, tributary of the Naknek River, to ascertain the relationship between total escapement and aerial and float survey estimates.
4. Surveys of King Salmon Creek and Big Creek should be conducted approximately August 1 and August 15, respectively. Four full days should be allowed for each float survey.
5. Spawning surveys of king salmon in Nushagak River index areas should be coordinated with the Commercial Fisheries Division's spawning survey efforts in that area.
6. Silver salmon of the Naknek, Alagnak, Kvichak and Nushagak systems should be studied concurrently with king salmon, insofar as program limitations will permit.
7. Preliminary work should be undertaken soon on the grayling in the Ugashik Lakes system.
8. The status of the presently utilized rainbow trout stocks of the Naknek, Alagnak and Wood River systems should be studied sufficiently to permit formulation of adequate guidelines for management.
9. Suitable barren lakes near centers of local population without ready access to a sport fishery

should receive experimental plants of readily available wild species.

10. The attempts to develop a freshwater commercial fishery in the lakes of the area should be followed closely.

OBJECTIVES

1. To assess the environmental characteristics of the existing and potential fishery waters of the job area and, where practicable, obtain estimates of existing or potential angler use and sport fish harvest.
2. To evaluate application of fishery restoration measures and availability of sport fish egg sources.
3. To assist as required in the investigation of public access status to the area's fishing waters.
4. To evaluate multiple water use, development projects (public and private) and their effects on the area's streams and lakes for the proper protection of the sport fish resources.

TECHNIQUES USED

Species composition and distribution were sampled by use of seine, gill nets and hook and line.

King salmon escapement in the Naknek River system was estimated by aerial and float surveys. Other sport species were also sampled during the float surveys. The reports of similar surveys carried out by Commercial Fisheries Division personnel in the Nushagak system are also utilized.

Supervisory personnel of the Commercial Fisheries Division and crew members at several field stations assisted by reporting data from their personal sport catches. Some samples were also contributed by responsible individuals who had been instructed in collection methods.

Biological information was collected during creel census activities.

The term "Dolly Varden/Arctic char" is used where taxonomic examination has not been carried out to determine specific identity.

FINDINGS

Naknek Watershed

The trend of the king salmon return to the Naknek River in 1964 was downward. Fishing success was poor at the beginning of the run and later improvement did not raise the final catch per hour to the level of previous years. The only information on this fishery which is fully comparable from season to season is the creel census report from the military recreation camp at the Naknek Rapids.

TABLE 1. - Catch Per Hour of King Salmon at Rapids Camp, Naknek River, 1957-1964 *

<u>Year</u>	<u>Fishermen Hours</u>	<u>No. of Kings</u>	<u>Fish Per Hour</u>
1956 **	1809	239	.13
1957 **	2977	188	.06
1958	5857	1446	.25
1959 ***	-	-	-
1960	3486	801	.23
1961 ***	-	-	-
1962	1555	358	.23
1963	2963	581	.20
1964	3001	361	.12

* Reported effort only; must be regarded as an index rather than a comprehensive total.

** Most effort directed toward rainbow trout.

*** Rapids Camp data included in total for all camps and not separable at this time.

The catch of king salmon at this site had remained between 0.20 to 0.25 fish per hour for an entire reproductive cycle but dropped significantly to 0.12 fish per hour in 1964.

This decline is of particular interest in view of the intensified sport effort which evidently took place in 1958 and was directed specifically toward king salmon. The effects of possible over-utilization in that year could be expected to be most noticeable in the following cycle of the dominant age group.

A float survey of Big Creek and aerial and float surveys of King Salmon Creek were completed for the first time during 1964. Two surveys of each system were made by helicopter through the cooperation of the Air Force. The results of all surveys for 1963 and 1964 are listed in Table 2.

TABLE 2. - Spawning Surveys of King Salmon in King Salmon Creek and Big Creek, Naknek Watershed, 1963 and 1964

Date	Type	Live	Dead	Total	Redds	Remarks
Big Creek:						
8/ 1/1963	Aerial*	362	0	362	-	Fair survey but covered only about half of stream length.
8/13/1963	"	1318	27	1345	-	Good survey. Spawning near peak.
7/31/1964	"	484	0	484	-	Survey fair to good; date early.
8/15/1964	"	-	-	636	-	Survey fair to good; near peak.
8/15-18/ 1964	Float	1031	99	1130	724	Survey fair to good. Redd count good.
King Salmon Creek:						
7/31/1964	Aerial*	-	-	378	-	Overcast; survey only fair.
8/11/1964	"	44	11	55	-	Poor survey; visibility poor and flight too hurried.
8/11-14/ 1964	Float	94	10	104	256	Poor survey; peak of spawning long past, water turbid in lower part of stream. Redd count only fair.

* Military H-21 helicopter.

It will be noted that the peak of spawning activity apparently occurred near the end of July in King Salmon Creek, while peak counts were not obtained in Big Creek until mid-August. All indications point to a low escapement. This is particularly true of King Salmon Creek.

The influence of the commercial catch upon Naknek River king salmon stocks cannot be estimated at this time. The take of this species by commercial fishermen is thought to be composed primarily of fish bound for the Naknek and Alagnak Rivers. No information on the relative magnitudes of these two stocks is available due to an almost complete lack of knowledge concerning the Alagnak population. Although some fishing effort was directed specifically toward kings during the 1964 season, the commercial catch is usually incidental to the red salmon fishery. It has varied from 1,600 to 23,000 fish during the the last 34 years, with a mean (geometric) of approximately

7,350 fish. The 1964 commercial catch for the Naknek-Kvichak district was 12,267 fish. The sport catch on the Naknek River this year is estimated to be under 2,000 fish.

Naknek River Rainbow Trout

Fishing success for rainbow trout in the Naknek River, as indicated by returns from the military recreation camps at the Naknek Rapids and at the outlet of Naknek Lake, continued to decline. The catch per hour during the period from the opening of the season through June 10 is shown in Table 3 for the years 1957 to 1964.

TABLE 3. - Fishing Effort and Success for Rainbow Trout at Lake and Rapids Camps, Naknek River, May 27 - June 10, 1957-1964

<u>Year</u>	<u>Fishermen</u>	<u>Fishermen Hours</u>	<u>No. of R. Trout</u>	<u>Fish Per Hour</u>
1957	210	1050	628	.60
1958	225	1238	711	.57
1959*	-	-	-	-
1960	100	623	289	.46
1961*	-	-	-	-
1962	108	732	293	.40
1963	82	1223	344	.28
1964	114	1352	325	.24

* Rapids and Lake Camp data included in total for all camps and not separable at this time.

Examination of fish taken during this early fishery, when a significant portion of the total rainbow trout catch is made, showed many to still be engaged in spawning. It is obvious that the April 15 - May 26 closure has not protected the latter portion of the spawning activities of this stock.

Study of the scale pattern and growth rate of the limited number of samples obtained in 1964 indicates that these fish probably utilize the lacustrine environment of Naknek Lake. Following an initial period of two to three years of slow development, growth rate is accelerated. Age 7+ fish from the Naknek River were approximately 24 inches long as compared to approximately 19 inches for King Salmon Creek-Big Creek rainbow trout. (See Figure 1)

Big Creek - King Salmon Creek

During float surveys of king salmon spawning in King Salmon Creek and Big Creek, sampling of the resident sport fish

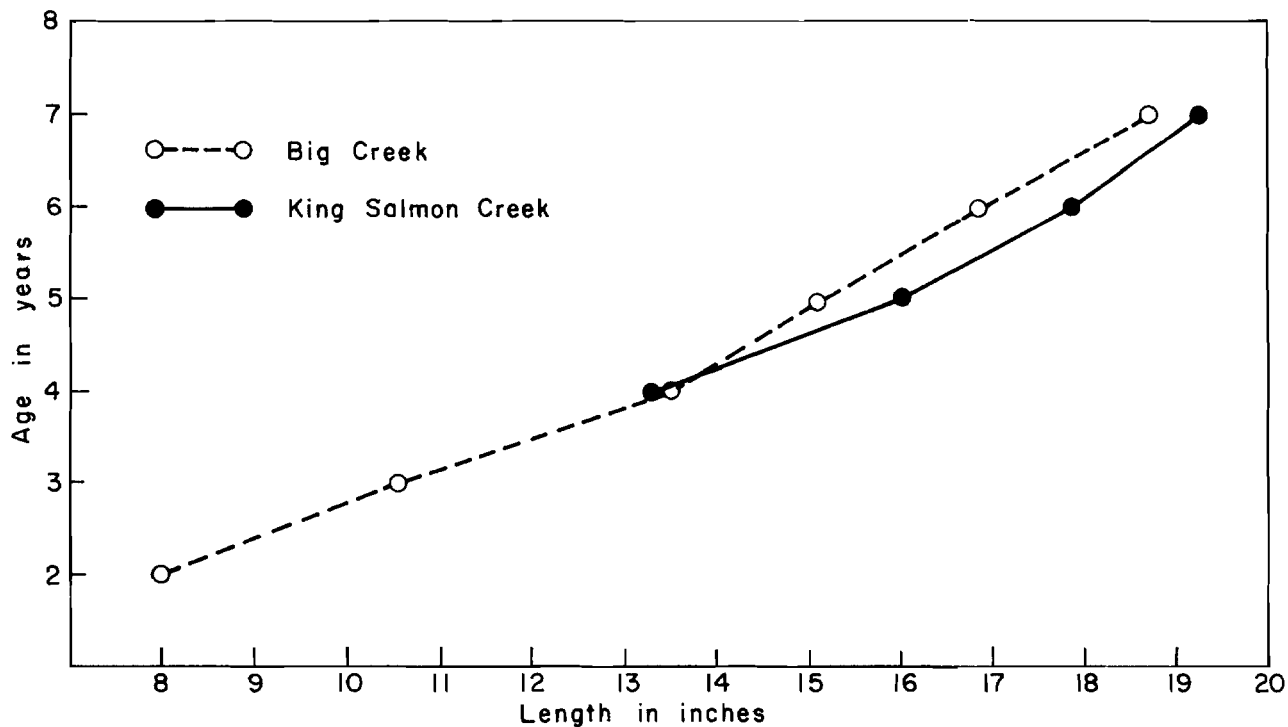


Figure 1. Length-age relationship of rainbow trout in King Salmon Creek and Big Creek, Naknek watershed, August, 1964.

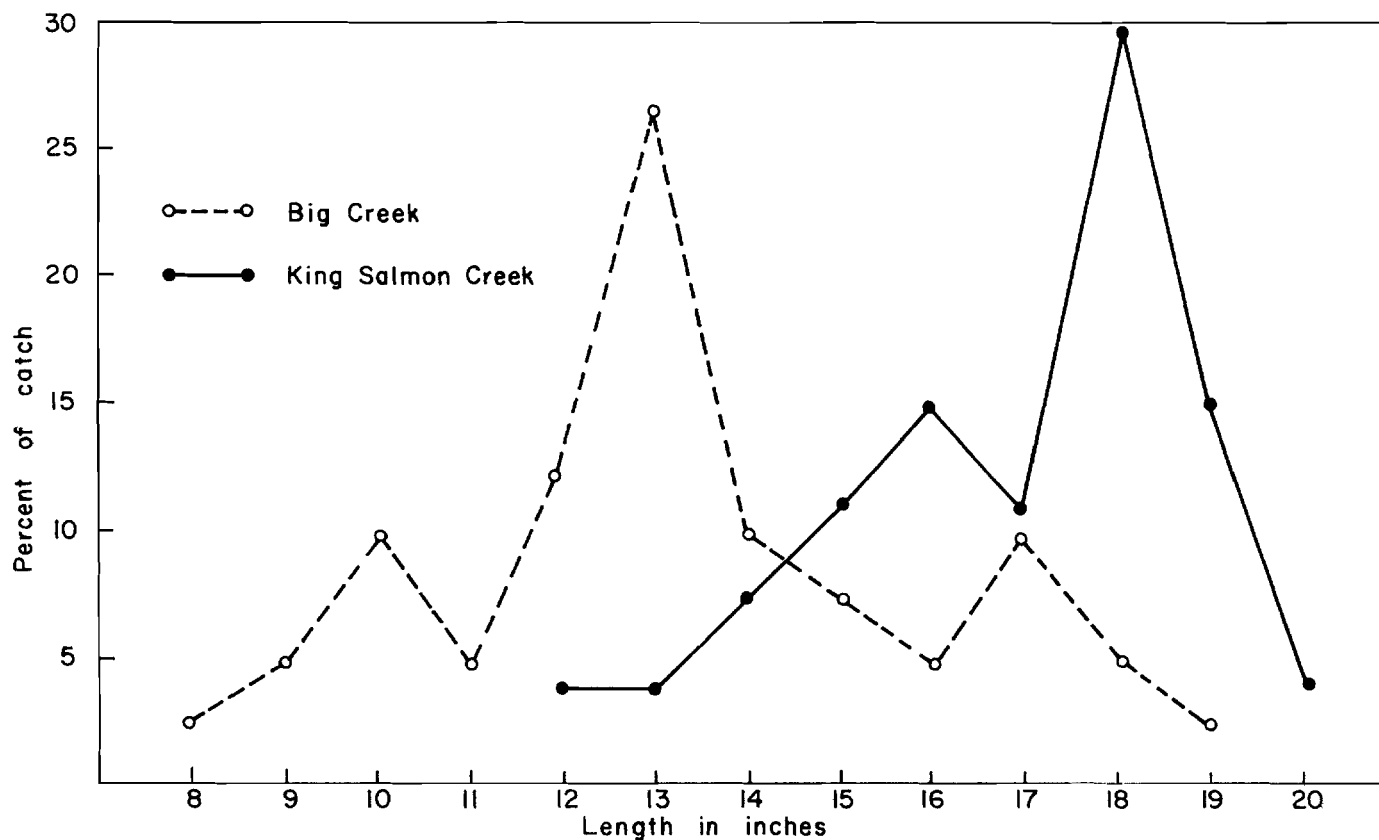


Figure 2. Size composition of rainbow trout catch, King Salmon Creek and Big Creek, Naknek watershed, August, 1964.

populations was conducted with hook and line. Spinning and bait casting gear were used in conjunction with artificial lures of the wobbler type. Barbs were removed from the hooks.

Most fish were released after taking a scale sample and recording length, although only the length measurement was taken from a random portion of the grayling catch. Only three days of satisfactory fishing were possible on King Salmon Creek. Conditions were favorable during all four days of the Big Creek survey. Grayling were found to be abundant, with rainbow trout common, while Dolly Varden were present in lesser numbers. Rainbow trout and Dolly Varden tended to concentrate immediately downstream from spawning king and chum salmon. Relative numbers of each species taken in the catch are shown in Table 4.

TABLE 4. - Species Composition of Sport Catch, King Salmon Creek and Big Creek, Naknek Watershed, August 1964

Creek	Grayling		R. Trout		Dolly Varden		Total Fish
	No. Fish	%	No. Fish	%	No. Fish	%	
King Salmon Creek	63	58	35	33	10	9	108
Big Creek	111	69	41	25	10	6	162

While both streams are similar in many respects, King Salmon Creek appears to be the most productive of the two when judged by the following evidence. Differences in the size and growth rate of the resident species are obvious from an analysis of the material collected. Not only was mean length of each species significantly greater in King Salmon Creek than in Big Creek, but fish of the same age group were larger in the former. However, Big Creek fish apparently become available to sport gear at an earlier age. Differences in size composition of the catch of each species between the two streams were more pronounced than the intraspecific divergence in growth rate.

The apparent greater productivity of King Salmon Creek cannot be positively correlated with physical characteristics of the habitat at this time, but certain features offer promise for further investigation. The topography of both watersheds has much in common, but a larger proportion of the length of King Salmon Creek is composed of meanders within a forested flood plain. Big Creek, though longer, runs through open tundra for most of its course with forest vegetation being much more sparse or entirely absent.

Table 5 lists mean ages and lengths of grayling, rainbow trout and Dolly Varden in Big Creek and King Salmon Creek.

TABLE 5. - Mean Length in Inches and Age in Years of Grayling, Rainbow Trout and Dolly Varden Trout in King Salmon Creek and Big Creek, Naknek Watershed, August 1964

Species	King Salmon Creek				Big Creek			
	No.	Mean Length	No.	Mean Age	No.	Mean Length	No.	Mean Age
Grayling	63	16.54	55	5.25	111	14.12	65	4.95
Rainbow	20	17.16	20	5.65	38	13.52	38	4.16
Dolly Varden	10	17.38	-	-	10	16.55	-	-

Figures 1 and 3 illustrate the size composition of the rainbow trout and grayling catch, respectively, by inclusive one-inch increments. Figures 2 and 4 present the length-age relationship for rainbow trout and grayling, respectively.

An interesting comparison of size composition of grayling within the total length of a stream is made possible by the division of Big Creek into four sections corresponding to the four days of fishing effort during the survey. Commencing at the headwaters and continuing downstream to the confluence with the Naknek River, a direct relationship is noted between the daily mean length of fish caught and the proximity of the headwater area. Rainbow trout did not consistently display a similar tendency. Mean size by day for grayling and rainbow trout is illustrated in Figure 5.

Naknek Lake and Waters of Katmai National Monument

On a visit to the mouth of an un-named creek in Bay of Islands, Naknek Lake (at approximately 58°42' N. Lat., 155°56' W. Long.) on September 15, three highly-colored male Arctic char (*S. alpinus*) were sampled in the catch of Northern Consolidated Airline's "Angler's Paradise" Camp guests. Lengths of 3 males ranged from 29 to 31 inches with ages of 8 and 9 years. Grayling varying between 10.0 and 15.5 inches were also taken at this location.

Data for the 1964 season from the Brooks River fishery are limited. Fishing success apparently ranged from fair to good, depending upon the time of the season and the ability of the angler. Dolly Varden make up a significant proportion of the catch within the river during June. Mean length of a sample of 10 rainbow trout was 16.2 inches. Age analysis of this small sample have no indication of any change from the growth rate reported by Greenbank (1954), whose work showed fish of this length to have entered their sixth year.

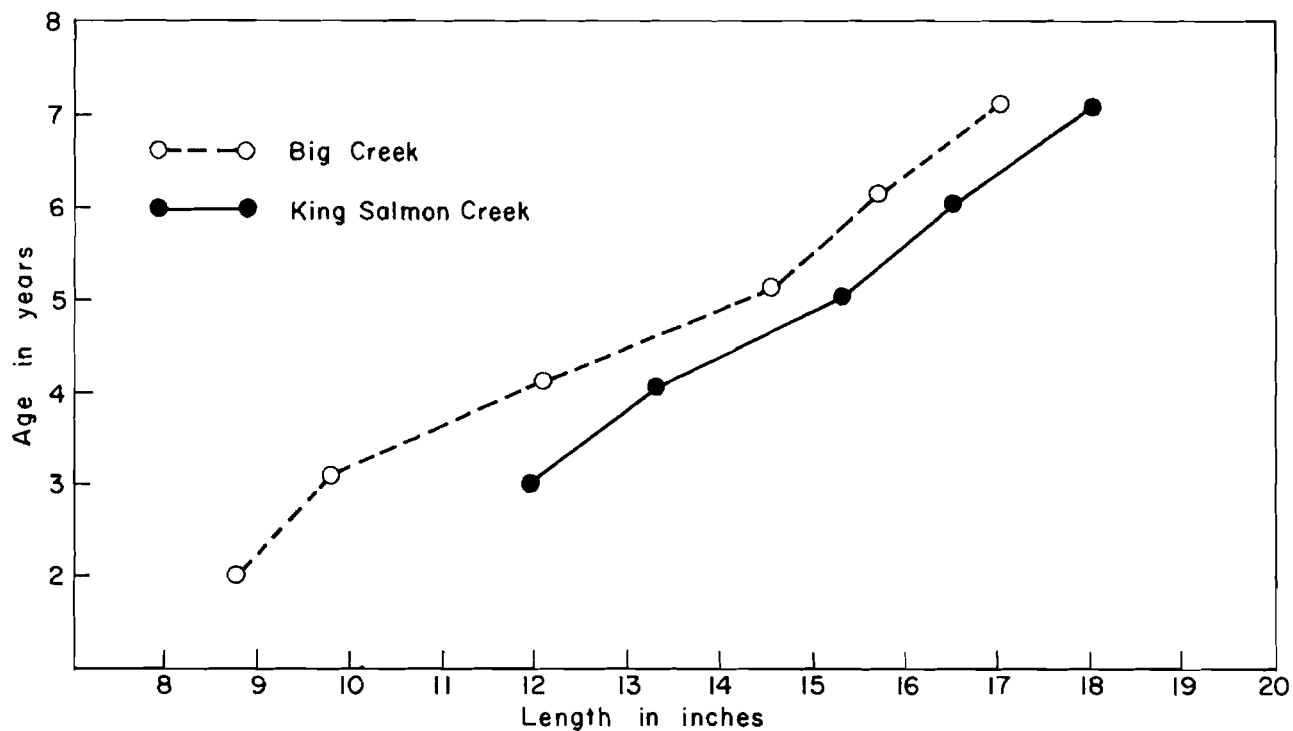


Figure 3. Length-age relationship of grayling in King Salmon Creek and Big Creek, Naknek watershed, August, 1964.

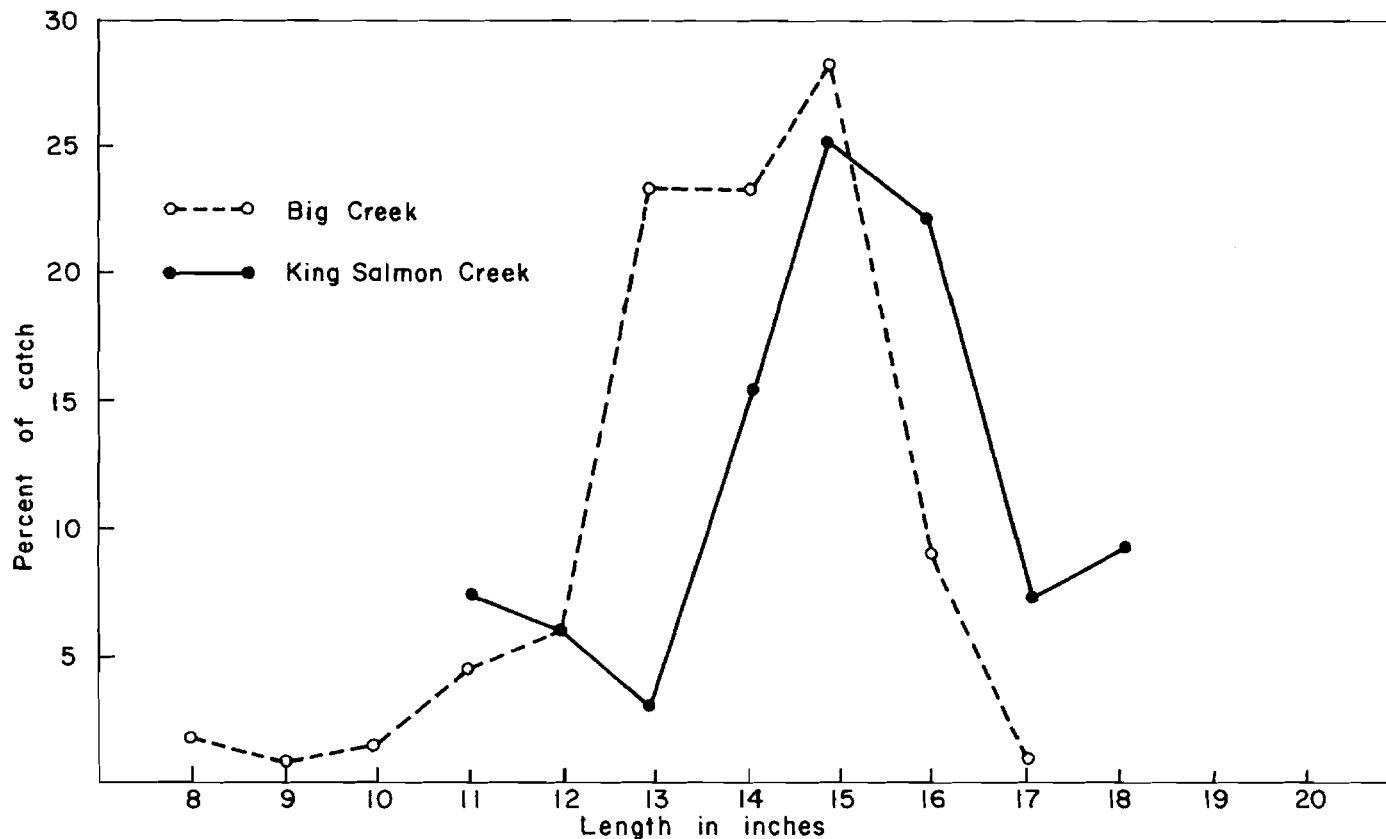


Figure 4. Size composition of grayling catch, King Salmon Creek and Big Creek, Naknek watershed, August, 1964.

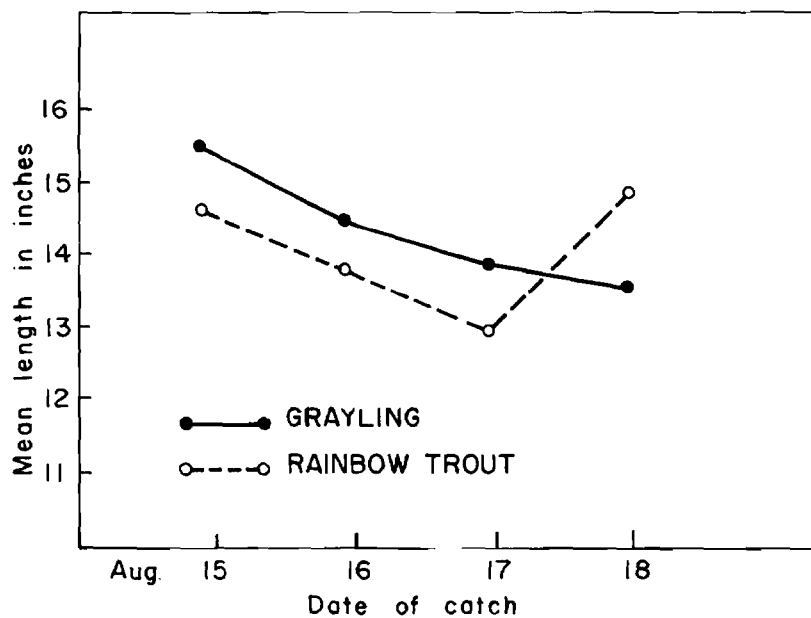


Figure 5. Mean lengths of grayling and rainbow trout taken on successive days of a float survey of Big Creek, Naknek watershed, August, 1964.

Alagnak (Branch) River Watershed

Experienced anglers were able to enjoy a high level of fishing success for rainbow trout at Kulik River, although the catch included a high percentage of smaller fish. A sample of 27 fish ranged from 9.7 to 25.0 inches in length, with the mean at 15.9 inches. No clear modal pattern is apparent in this small sample, since age groupings cover an extremely wide range of lengths, suggestive of the presence of two races. Specimens with 5 annuli, for instance, ranged from 12.7 to 17.8 inches and those with 6 annuli included fish from 13.8 to 21.6 inches in length. Ages three through seven were present in the sample.

The scale pattern of the larger specimens in each age group indicates that these fish may enter the lacustrine environment on Nonvianuk Lake, after an initial period of two or three years of slow growth, presumably in the parent stream. The smaller specimens do not display such a rapid acceleration of growth at that stage of development.

A small sample of 8 fish taken at the Funnel-Moraine Creek junction in mid-September shows a much narrower range with lengths confined between 19.2 and 24.5 inches. Only fish with six and seven annuli were represented.

Kvichak River Watershed

A discussion of the progress of research on the sport fishes of this drainage is included in the report for Job. No. 12-C, Inventory of Sport Fish Populations in Western Alaska Lakes, Dingell-Johnson Annual Report of Progress, Volume 6, 1964-1965, pages 249-261.

Nushagak Bay Watershed

Igushik River Drainage

An indication of the sport fish potential during July at the outlet of the lower Igushik Lake, Lake Amanka, was obtained from samples collected by the crew of the Commercial Fisheries Division field station at that point. The catch was composed primarily of rainbow trout and Dolly Varden/Arctic char. Rainbow trout were of small size, ranging between 11 and 14 inches. Success was low with an average fishing time of one hour required for each rainbow. Success generally improves considerably after the first part of August.

Snake River Drainage

A similar report from the Department crew at the Snake River tower at the outlet of Lake Nunavaugaluk showed a catch consisting solely of Dolly Varden/Arctic char ranging between 11 and

16 inches in length. They were described as "abundant, small, in poor condition and parasitized."

Wood River Drainage

Little sampling was accomplished in this watershed during 1964. Overnight catches by sampling nets set in Lake Aleknagik and in Wood River just below the lake outlet in mid-August were notable chiefly for the abundance of round whitefish (Prosopium cylindraceum).

A sample of 8 rainbow trout taken from the Agulowak early in August ranged between 15 and 19 inches in length.

Nushagak River Drainage - Tikchik Lakes and Nuyakuk River

A sample of 27 fish taken by trolling near the Tikchik Narrows in mid-September included 23 lake trout, 3 Arctic char and 1 rainbow trout. The rainbow trout was 28 inches long and 9 years old. The Dolly Varden/Arctic char were between 24 and 27 inches long. Lake trout ranged from 22.5 to 32.0 inches long and from 2.5 to 10.0 pounds. Mean length was 26.25 inches, while age ranged from 7 to 13 years, with the wide variation in the age-to-size ratio typical of the species.

Sport fishing activities of the Commercial Fisheries Division crew near the lower end of the Nuyakuk River yielded pike and grayling. The pike ranged between 26 and 31 inches and the grayling between 14 and 16 inches. Humpback whitefish (Coregonus pidschian) were frequently taken in the seine by this crew while sampling migrating red salmon. This is indicative of an impressive abundance of whitefish which should be available to sport fishermen using a single salmon egg on a small hook.

A few parties of fishermen in the immediate vicinity of Ekwak on the Nushagak River took rainbow trout up to 27 inches in length with good success, indicating that the availability of this species throughout the main section of the Nushagak River may be much greater than generally realized.

Data collected by personnel of the Commercial Fisheries Division during float surveys of king salmon escapement in King Salmon River and Old Stuyahok River have been made available. Information is included on the size and abundance of the populations of sport species in the catch from those streams. This material for the years 1962 to 1964 is listed in Tables 6 and 7.

The return of king salmon to the Nushagak River in 1964 was evidently large. The commercial catch for the Nushagak District of 108,606 fish is the highest since 1929. Observed escapements, as reported by personnel of the Commercial

TABLE 6. - Length Data of Rainbow Trout, Grayling, and Dolly Varden Trout from the King Salmon River and Old Stuyahok River, Nushagak Watershed, 1962-1964

Dates of Survey	Grayling			Rainbow Trout			Dolly Varden Trout		
	No.	Range*	Mean*	No.	Range	Mean	No.	Range	Mean
King Salmon River:									
8/ 9-14, 1962	**			28	12.0-22.0	17.6	4	17.5-21.5	18.8
8/ 4- 8, 1963	**			**			**		
8/12-16, 1964	31	13.0-18.0	15.3	25	12.0-19.75	16.5	6	14.5-18.5	15.8
Old Stuyahok River:									
8/ 6- 9, 1963	6	13.0-16.0	14.25	9	9.25-20.0	15.25	**		
8/ 5- 9, 1964	18	13.5-16.0	14.8	22	13.0-20.5	15.1	**		

* Measurements are in inches; the mean is arithmetic.

** Sampling inadequate.

TABLE 7. - Catch Composition and Fishing Success on King Salmon River and Old Stuyahok River, Nushagak Watershed, 1962-1964

Dates of Survey	No. of Fish by Species								Man-Hrs.	Catch/Hr.
	RB*	GR	DV	KS	SS	RS	CS	Total		
King Salmon River:										
8/ 9-14, 1962	28	63	12	0	3	0	0	106	17	6.18
8/ 4- 8, 1963	47	206	42	2	2	21	0	320	40	8.20
8/12-16, 1964	18	81	19	2	7	10	0	137	17	8.06
Old Stuyahok River:										
8/ 5- 9, 1964	20	35	4	3	4	0	2	68	11	6.18

* Explanation of legend:

RB - Rainbow trout DV - Dolly Varden trout SS - Silver salmon CS - Chum salmon
 GR - Grayling KS - King salmon RS - Red salmon

Fisheries Division, showed considerable variation between index areas within the system but are thought by the author to be adequate. A float survey estimate of 335 fish for King Salmon River is not substantially below the number usually observed there in the past when the timing of the survey is considered (Table 8). Consecutive float surveys one week apart in 1962 demonstrated the rapidity with which the total count of king salmon may be expected to dwindle following the peak of spawning. The float count of 1,689 kings in the Old Stuyahok River is a marked increase over the estimate of 433 fish obtained on a similar survey at the same date in 1963.

The commercial catch of silver salmon of 26,416 fish for the Nushagak District is well within the range of recent years.

Ugashik River Watershed

Twelve grayling taken at the outlet of Lower Ugashik Lake between May 24 and July 9 ranged between 15.5 and 20.0 inches in length, while ages varied from 6 to 9 years.

An attempt to obtain a larger sample during mid-October at the Narrows between the upper and lower lakes was unsuccessful. The entire area was still crowded with spawning red salmon at that date and no grayling were seen during sampling activity over a three-day period. Dolly Varden/Arctic char were present among the salmon and frequently taken on hook and line.

It seems probable that two species of the char complex, in addition to lake trout, are present in this watershed. Sea-run Dolly Varden were sampled that were taken incidentally to the red salmon commercial fishery in Ugashik Bay. They were also taken at the Narrows in spawning configuration during October. Char, which exhibit no evidence of ocean existence in either their appearance or scale pattern, were also present. These were apparently more abundant at this location and date than the sea-run fish. Taxonomic examination would probably reveal these two varieties to be S. malma for the sea-run type and S. alpinus for the lake residents.

Togiak Bay Watershed

Togiak River Drainage

Sport fishing activities of the Commercial Fisheries Division crew manning the counting tower for red salmon at the outlet of Lower Togiak Lake yielded Dolly Varden/Arctic char and grayling. Both species were readily available. The numbers of the char complex ranged from 12.0 to 20.5 inches in length while the grayling measured 12.5 to 17.0 inches.

No other samples were obtained from this watershed this year, although John Pearson reported that parties from his wilderness camps fished both the Pungokebuk and Gechiak Lake

TABLE 8. - Float Survey Index Counts of King Salmon Spawners in King Salmon River and Old Stuyahok River, Nushagak Watershed, 1957-1965

Location	Dates of Survey	No. of Fish	Remarks
King Salmon River	August 7- 9, 1957	424	Good survey.
	August 19-20, 1958	8	Date too late; water extremely high.
	August 2- 5, 1959	3,282	Tremendous numbers of fish.
	August 6- 8, 1960	174	Visibility poor; water high.
	August 3- 6, 1961	497	Water too high for good visibility.
	August 3- 7, 1962	543	Visibility poor during part of survey. Spawning at peak.
	August 10-12, 1962	262	Late date.
	August 4- 6, 1963	540	Excellent visibility.
	August 12-15, 1964	335	Late date for survey.
Old Stuyahok River	August 5- 8, 1963	433	Visibility poor during one third of survey.
	August 5- 9, 1964	1,689	Very good survey.

outlets for rainbow trout with good success. While the size of the individual specimens obtained there (up to 31 inches) provides considerable attraction, these locations have not produced more than three or four fish on any single visit. The streams are of relatively small size and the fish apparently become alarmed easily.

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Prepared by:

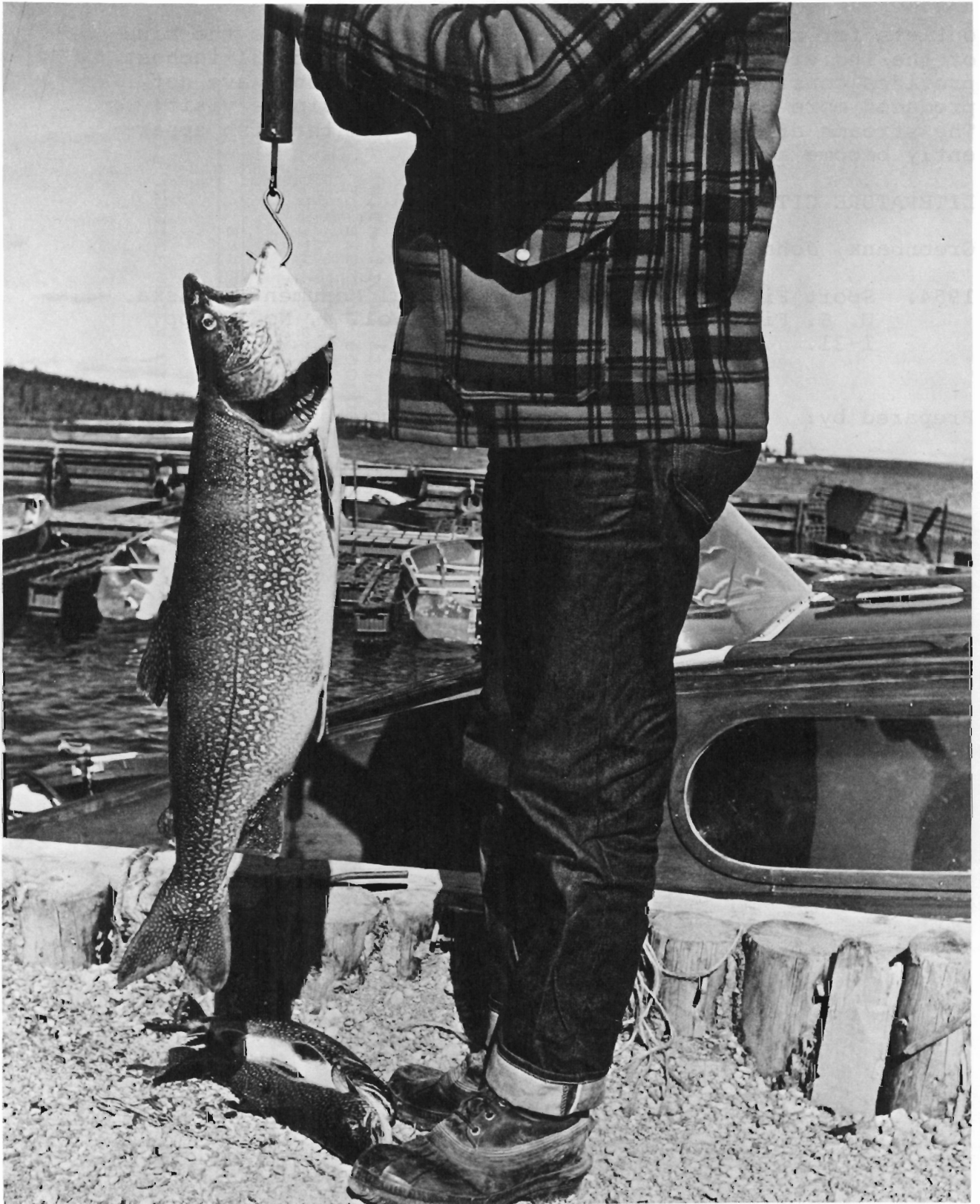
Dean Paddock
Fishery Biologist

Date: March 1, 1965

Approved by:

s/ Louis S. Bandirola
D-J Coordinator

s/ Alex H. McRea, Director
Sport Fish Division



Interior Alaska waters yield trophy size lake trout.